ATTITUDES OF PREGNANT WOMEN TOWARD VACCINATION AGAINST COVID-19 – A STUDY CONDUCTED IN POLAND IN THE FIRST QUARTER OF 2022

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SUMMARY

Objectives: The study aimed to assess the attitudes of pregnant women toward vaccination against COVID-19.

Methods: The research was conducted using a diagnostic survey with our original questionnaire among 283 pregnant women. The survey was carried out in Poland in the first quarter of 2022. Statistical analyses were performed using IBM SPSS 26.0 ($p < 0.05$).

Results: It was shown that 140 (49.5%) pregnant women were vaccinated against COVID-19, of which 90 (64.3%) received vaccination during pregnancy. In the group of 143 (50%) unvaccinated people, only 11.9% of respondents expressed willingness to be vaccinated against COVID-19. The most frequently cited arguments for receiving the vaccine were fear of a severe course of the disease (37.5%) and the possibility of passing antibodies to a child (37.1%). Women who did not undergo vaccination believed that they did not want to put themselves and their babies at risk (39.9%) and were concerned about adverse post-vaccination reactions (35.2%) and the safety of the vaccine (32.5%). Women with higher education and professionally active ($p = 0.004$) were vaccinated more often than respondents with a lower level of education ($p < 0.001$). Age ($p = 0.101$) and place of residence ($p = 0.179$) did not indicate statistically significant differences in decision-making regarding vaccination against COVID-19.

Conclusion: Pregnant women presented both pro- and anti-vaccination attitudes. Less than half of the respondents were vaccinated against COVID-19, and most of the women took the preparation during pregnancy. Selected socio-demographic factors determined women's attitudes toward vaccinations against COVID-19. Medical personnel should play a role in deciding whether a pregnant woman is vaccinated.

Key words: pregnancy, COVID-19, vaccination, attitudes

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INTRODUCTION

The SARS-CoV-2 virus first appeared in Wuhan, Hubei province, China, in November 2019. It rapidly spread across the globe. On January 30, 2020, the World Health Organization (WHO) Crisis Committee declared a global health and life-threatening emergency due to the increasing rates of new cases reported within China and worldwide (1).

The SARS-CoV-2 virus causes a disease called COVID-19. Over 6.5 million cases of COVID-19 have been diagnosed in Poland, and almost 120,000 people have died from this disease (2). The virus spreads primarily through droplets, in particular as a result of exposure to the upper respiratory tract secretions of an infected person. It has also been shown that there is a possibility of infection through indirect contact with virus-contaminated surfaces or objects (3). Available epidemiological data indicate that the SARS-CoV-2 virus may be responsible for various symptoms of the so-called COVID disease. These are most often fever, muscle pain, cough (mostly dry), shortness of breath, headaches, taste and smell disturbances, and general fatigue (4, 5). In most infected people, the disease is asymptomatic (72%), and in 8% of patients, the symptoms are mild. However, a group of the population experiences severe infections necessitating specialized care and treatment (6).

High-risk groups with a more severe course of the disease primarily include the elderly, patients with comorbidities, and pregnant women (7). Pregnant women are more at risk of severe infection and hospitalization in the anaesthesiology and intensive care unit than non-pregnant women of reproductive age (8). Pregnancy causes physiological changes in a woman's body related to the functioning of the circulatory, respiratory and immune systems, which predispose to the occurrence of severe respiratory complications related to SARS-CoV-2 viral infection (9). Preliminary reports indicate that COVID-19 infection during pregnancy may expose a woman to severe preeclampsia, premature rupture of membranes, or premature birth. In the event of virus infection, termination of pregnancy, according to current recommendations, takes place by caesarean section (10). Pregnant women infected with SARS-CoV-2 and symptoms of respiratory failure should be

isolated and hospitalized in wards adapted to perform caesarean sections. COVID-19 infection has not been shown to increase the risk of miscarriage in the early stages of pregnancy. However, one of the symptoms of SARS-CoV-2 infection is increased body temperature that leads to hyperthermia, which, in the early stages of pregnancy, increases the risk of congenital defects, especially the neural tube (8).

Vaccination against COVID-19 is an effective method of preventing severe infection with the SARS-CoV-2 virus. Research indicates that the effectiveness of the COVID-19 vaccine in pregnant women is broadly similar to that in non-pregnant women. In April 2021, the Polish Society of Gynaecologists and Obstetricians expressed its support for offering COVID-19 vaccines to pregnant and breastfeeding women. Vaccination protects pregnant women against infection and severe disease, thus minimizing the risk of complications dangerous to the foetus and newborn. Currently, there is no data on the harmful effects of vaccination on foetal development, but it is recommended that vaccination be administered post-organogenesis (11). The study aimed to determine the attitude of pregnant women toward vaccination against COVID-19.

MATERIALS AND METHODS

A cohort study was conducted among pregnant women in Poland during the first quarter of 2022. This anonymous study included 283 participants. Women were eligible to participate if they were at least 18 years old on the day of the survey, regardless of their gestational age, and had provided informed consent. Those who did not meet these criteria were not included in the study. A self-administered survey questionnaire was utilized on an online platform to gather relevant information. The questionnaire included a brief introduction explaining the purpose of the study and instructions on how to complete it. A link to the questionnaire was shared on a social networking site aimed at pregnant women, focusing on various aspects of motherhood. All participants were informed about the study's purpose, procedures, and the assurance of anonymity. Each woman involved in the study provided her consent. The research was conducted under the principles outlined in the Declaration of Helsinki. However, the exclusively online method of conducting the study may have introduced a selection bias in the sample due to factors such as digital exclusion or the reliance on a single platform for recruitment.

The survey questionnaire consisted of 33 closed and semi-open questions. This tool included both single- and multiple-choice questions. The first part of the survey questionnaire concerned the demographic and social data of the study participants. The survey further included questions about their opinions and attitudes regarding vaccinations against COVID-19.

The test results were analysed using the IBM SPSS 26.0 package with the Exact Tests module – exact tests. The results obtained were presented in the form of frequencies, percentages and numbers. The level of statistical significance was considered $p < 0.05$.

RESULTS

A total of 283 pregnant women were included in the study. The largest group consisted of respondents aged 26–30 (49.1%), living in the countryside (63.3%) and married (72.4%). Most women had higher education (66.5%), the remaining respondents had secondary education (30.0%) and primary or basic vocational education (3.5%). The vast majority of respondents were professionally active (74.6%) and described their financial situation as good (58.0%). More than half of the women (55.5%) were pregnant for the first time, and at the time of the study, most women were in the second trimester (41.3%). The majority of respondents (61.5%) confirmed that they had suffered from COVID-19 before becoming pregnant, and 8.5% of respondents answered that they had been ill during pregnancy. Among women infected with SARS-CoV-2, the most common symptoms of COVID-19 disease were smell and taste disorders (38.7%), muscle and joint pain (24.8%), and fever (18.8%). Symptoms such as breathing difficulties, shortness of breath (7.4%), and chest pain (6.7%) were much less common. Details are presented in Table 1.

Table 1. *Socio-demographic and medical characteristics of the respondents (N = 283)*

Variable	n	%
Age group (years)		
Under 25	70	24.6
26–30	139	49.1
31–35	60	21.1
> 36	15	5.2
Domicile		
Village	179	63.3
City	104	36.7
Marital status		
Married	205	72.4
Single	28	9.9
Divorcee	7	2.5
Free partnership	43	15.2
Education		
Basic/basic vocational	10	3.5
High school	85	30.0
Higher education	188	66.5
Financial situation		
Very good	73	25.8
Good	164	58.0
Average	44	15.5
Bad	2	0.7
Professional activity		
Working	211	74.6
Studying	14	4.9
Unemployed person	24	8.5
Other	34	12.0
Number of pregnancies		
First	157	55.5
Second	94	33.2
Third	25	8.8
Fourth and next	7	2.5

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Variable	n	%
Gestational age		
1st trimester	58	20.5
2nd trimester	117	41.3
3rd trimester	108	38.2
Course of previous pregnancies		
Normal	124	43.8
With complications	2	0.7
Having COVID-19 before pregnancy		
Yes	174	61.5
No	109	38.5
COVID-19 disease during pregnancy		
Yes	24	8.5
No	259	91.5
Symptoms accompanying SARS-CoV-2 infection[a]		
Disturbances of smell and taste	109	38.7
Muscle and joint pain	70	24.8
Fever	53	18.8
Breathing difficulties	21	7.4
Pain in the chest	19	6.7

[a]Multiple answers possible

The women surveyed were asked about the effects of SARS-CoV-2 virus infection during pregnancy. Most respondents (79.9%) believed that COVID-19 disease could be the cause of death, while the remaining were either uninformed (12.3%) or had a different opinion (7.8%). The respondents indicated that the most common effects of SARS-CoV-2 virus infection were respiratory complications (75.6%) and cardiac complications (15.5%). A significantly lower percentage of women (8.9%) reported complications related to the nervous system. Nearly half of the respondents (44.2%) believed that pregnancy may make COVID-19 more severe, and 22.3% of women were of the opposite opinion. More than one third of respondents (33.5%) had no knowledge in this area. The majority of pregnant women (58.0%) participating in the study reported premature delivery as the main complication resulting from COVID-19 infection during pregnancy. The next most prevalent complications indicated were a more severe disease trajectory (49.8%), greater risk of treatment in the ICU (47.3%), and the need to end the pregnancy by caesarean section (44.2%). Moreover, 30.4% of respondents believed that the SARS-CoV-2 virus influenced the birth of a child with low birth weight. Few women (18.0%) believed that COVID-19 infection could cause preeclampsia.

During the research, more than half of pregnant women (50.5%) were not vaccinated against COVID-19. The remaining patients declared that they were vaccinated against SARS-CoV-2, and the majority of women (64.3%) decided to get vaccinated during pregnancy. Women who were vaccinated during pregnancy most often did so in the second trimester (55.0%), then in the third (25.0%), and least often at the beginning of pregnancy, i.e., in the first trimester (19.1%). In the group of unvaccinated women, only 11.9% of respondents expressed their willingness to be vaccinated against COVID-19, and one fifth of women could not determine whether they would make such a decision (Table 2).

Women who chose not to be vaccinated during pregnancy most often justified their decision on the grounds that taking the product would put them and the unborn child at risk (39.9%). Moreover, 35.2% of respondents indicated fear of adverse effects of vaccination, and some (32.5%) questioned the vaccine's safety. However, 37.5% of pregnant women with a positive attitude toward vaccinations against COVID-19 motivated their decision to get vaccinated by fear of a severe course of the disease and 37.1% by desire to protect their child by transferring antibodies; 32.5% of women said that they believed in the development of medicine and the effectiveness of vaccination (Table 3).

Among the respondents, the most vaccinated women were those aged 26–30 (n=67) and 31–35 (n=37) years. Moreover, women living in cities were more likely than respondents living in rural areas to opt for COVID-19 vaccination. Despite the ob-

Table 2. *Attitude of pregnant women to vaccination against COVID-19 during pregnancy (N=283)*

Question	Answer	n	%
Have you been vaccinated against COVID-19?	Yes	140	49.5
	No	143	50.5
Did you decide to get vaccinated due to a planned pregnancy? (question for vaccinated people)	Yes	40	28.6[a]
	No	100	71.4[a]
Were you vaccinated during pregnancy? (question for vaccinated people)	Yes	90	64.3[a]
	No	50	35.7[a]
In which trimester did you receive the vaccine? (question for vaccinated people)	First	18	20.0[b]
	Second	50	55.5[b]
	Third	22	24.5[b]
Will you be vaccinated during pregnancy? (question for unvaccinated people)	Yes	17	11.9[c]
	No	96	67.1[c]
	I don't know	30	20.9[c]

[a]Percentage calculated in relation to the group of vaccinated women (n = 140)
[b]Percentage calculated in relation to the group of women vaccinated during pregnancy (n = 90)
[c]Percentage calculated for the group of unvaccinated women (n = 143)

Table 3. *Women's arguments regarding COVID-19 vaccine during pregnancy*

Question	Answer	n	%
Arguments for taking the COVID-19 vaccine during pregnancy (question with multiple answer options)	I am afraid of the serious course of the disease	53	37.5
	I want to pass antibodies to my child	52	37.1
	I believe in the development of medicine and the effectiveness of vaccination	46	32.5
	After vaccination, I have more opportunities, e.g., I can travel abroad	15	10.6
	I feel pressure from my loved ones	5	3.2
Arguments for not taking the COVID-19 vaccine during pregnancy (question with multiple answer options)	I am afraid of side effects of vaccination	50	35.2
	I don't know if the vaccine is safe	47	32.5
	I don't want to put myself and the baby at risk	57	39.9
	I am against vaccinations	11	7.8
	I do not believe in the danger caused by SARs-CoV-2 infection	14	10.0
	I was convinced to do so by the negative opinion about vaccinations among my parents and friends	7	4.6
	I have contraindications to vaccination confirmed by a doctor	4	2.8

served differences, there was no statistically significant relationship between age ($p=0.101$), place of residence ($p=0.179$), and vaccination status among the surveyed women.

Women with higher education were vaccinated against SARS-CoV-2 more often than those with lower levels of education. The relationship between the variables was statistically significant ($p<0.001$). Unemployed women and women studying were less likely to be vaccinated against COVID-19 compared to other respondents. Statistically significant differences were found in this respect ($p=0.004$) (Table 4).

DISCUSSION

The emergence of the SARS-CoV-2 virus in the world has presented the healthcare system with many challenges. An essential element in limiting the scale of the pandemic was the establishment of principles of prevention, diagnosis, and treatment. Furthermore, a particular challenge for health care was determining the treatment of a pregnant woman during the course of the disease and childbirth, including establishing standards of care for the newborn immediately after birth (12).

Table 4. *Socio-demographic factors and having been vaccinated against SARS-CoV-2*

Variable	Vaccination against COVID-19				Total		p-value
	Yes		No				
	n	%	n	%	n	%	
Age (years)							
Under 25	28	40.0	42	60.0	70	100.0	0.098
26–30	67	48.6	71	51.4	138	100.0	
31–35	37	61.7	23	38.3	60	100.0	
Over 36	8	53.3	7	46.7	15	100.0	
Education							
Primary/vocational	4	40.0	6	60.0	10	100.0	<0.001
Secondary education	27	31.8	58	68.2	85	100.0	
Higher education	109	58.0	79	42.0	188	100.0	
Domicile							
City	94	52.5	85	47.5	179	100.0	0.179
Village	46	44.2	58	55.8	104	100.0	
Professional status							
Unemployed	4	16.7	20	83.3	24	100.0	0.004
Professional work	111	52.6	100	47.4	211	100.0	
Studying	5	35.7	9	64.3	14	100.0	
Other	20	58.8	14	41.2	34	100.0	

Women participating in this study were asked about contracting COVID-19 during pregnancy and about the symptoms accompanying the infection. The most common responses from respondents included smell and taste disturbances (38.7%), muscle and joint pain (24.8%), and fever (18.8%). The symptoms experienced by the participants of our study were similar to those mentioned by other authors (13). In a retrospective analysis of pregnant women infected with SARS-CoV-2, the following symptoms were determined: increased body temperature, cough, muscle pain, and sore throat. These results were comparable to those obtained in the present study. In their research, women indicated that, in their opinion, the main complication resulting from COVID-19 infection during pregnancy may be premature birth (58.0%). In addition, the respondents also mentioned a more severe disease trajectory (49.8%), an increased risk of hospitalization in the ICU (47.3%), and the need to end the pregnancy by caesarean section (44.2%). The obtained results were consistent with the reports by Di Mascio et al. (14), whose aim was to present analyses of a systematic review regarding pregnancy and perinatal outcomes in the case of coronavirus infections, in particular the disease caused by COVID-19. The research included 41 women infected with SARS-CoV-2. Among the respondents, the main infection complication was premature birth (41%), and too early break of amniotic fluid in 18.8% of patients. Moreover, the authors of the study pointed out that 14% of women in the study population were diagnosed with preeclampsia (14). Respondents in our study (18.0%) also noted the risk of such a complication.

A key element of the study was to learn the opinions and attitudes of pregnant women toward vaccinations against COVID-19. It should be emphasized that the expert team of the Polish Society of Gynaecologists and Obstetricians, based on published global data, their research, and observations, recommended vaccination against COVID-19 to pregnant and breastfeeding women (11). In our research, 49.5% of women expressed similar beliefs, of which the vast majority of patients decided to get vaccinated during pregnancy, and the rest took the preparation due to a planned pregnancy. Among unvaccinated women, the vast majority answered that they would not get vaccinated during pregnancy, while one fifth of the women were undecided. It is worth noting that an important factor that determined the willingness to receive the COVID-19 vaccine among pregnant women was primarily the fear of a severe disease trajectory during pregnancy (37.5%), and the desire to protect their unborn child by transferring antibodies (37.1%). This motivation was probably dictated by the disseminated knowledge about the course of the disease among pregnant women. So far, based on the research conducted, it was believed that the disease during pregnancy may be associated with a higher incidence of undesirable complications than among non-pregnant women. Moreover, these complications affected both mothers and newborns. The most frequently listed complications included intrauterine growth inhibition, premature birth, use of endotracheal intubation, renal failure, the need for treatment in the intensive care unit, and disseminated intrauterine coagulopathy (15). Nevertheless, it should be noted that there are also studies showing that the symptoms reported by pregnant women infected with SARS-CoV-2 are similar to the symptoms occurring among non-pregnant adult women suffering from COVID-19 (8). Research in the above area should be continued, primarily by expanding the number of analysed groups and their duration. However, it is undeniable that pregnant women are more vulnerable to infections caused by respiratory pathogens, which can lead to severe pneumonia. Therefore, this group is also more susceptible to SARS-CoV-2 infection Accordingly, pregnant women should be considered a particularly high-risk patient population for which strategies should be implemented to limit the possibility of contracting the virus (16).

Finally, women who stated they were unwilling to be vaccinated were interviewed to understand their reasons for this decision; 35.2% cited fear of vaccination side effects, while 39.9% expressed concern about potentially endangering themselves and their unborn child. Moreover, 32.5% of respondents also questioned the safety of the vaccine. Also, research by Goncu Ayhan et al. (17) indicated low acceptance of vaccines by pregnant women. Of all study participants, only 37% of women were willing to receive the vaccine if it was recommended to pregnant women. Respondents who said they would refuse to receive the vaccine indicated the lack of data on the safety of the COVID-19 vaccine in the pregnant population and potential damage to the foetus as the most critical concerns (17). It is worth noting that the WHO emphasized that not getting vaccinated is a serious threat to health. Among the factors influencing the decision not to vaccinate, the most frequently cited are fear or lack of trust in the vaccine and underestimation of the vaccine's value (18).

This study assessed the impact of socio-demographic factors on the decision to vaccinate against COVID-19 among respondents. Such a relationship was demonstrated in the case of education and professional activity – women with a lower level of education and those unemployed and studying were less likely than other respondents to opt for vaccination. In their research, Mappa et al. (19) pointed out factors that correlate with pregnant women's higher acceptance of vaccinations against COVID-19. According to the mentioned researchers, these correlating factors included reliable information and a higher level of education and employment. Other authors also obtained similar results (20).

To sum up, it should be noted that the success of the first-phase prevention in the form of vaccination against COVID-19 depends not only on the vaccine's effectiveness, but also on its acceptance by target groups. For this reason, implementing an educational strategy on vaccinations, explaining the mechanism of their action, and building trust in science seems to be an essential element supporting preventive activities related to COVID-19.

Limitations

The research conducted is subject to certain limitations. Caution should be exercised when interpreting results and formulating conclusions because the intentions or responses in the survey may differ from the future behaviour of the surveyed women. Moreover, opinions may change, especially in the face of health threats. The method employed for conducting the survey, which was exclusively online, may have introduced errors in selecting the study population. This could be due to factors such as digital exclusion or sampling from a single platform. Nevertheless, research in the analysed area should be continued. Identifying attitudes among particularly vulnerable groups, such as pregnant women, is useful for creating strategies to prevent and combat not only COVID-19 but also other infectious diseases.

CONCLUSIONS

Pregnant women included in the study presented both pro-vaccination and anti-vaccine attitudes. Less than half of the respondents were vaccinated against COVID-19, and most of the women took the preparation during pregnancy. The most common reasons cited by pregnant women for declining the SARS-CoV-2 vaccine were a fear of the vaccine's possible side effects and a strong desire to minimize any potential risk to themselves and their babies. Women who expressed a desire to receive the vaccine cited their fear of the disease's severity and a willingness to pass on antibodies to their children as motivating factors. The factors determining a positive attitude toward vaccination against COVID-19 were education and professional activity. Women with higher education and professionally active more often received vaccination than pregnant women with a lower level of education and unemployed. The respondents' age and place of residence did not influence the decision-making process regarding vaccination against COVID-19. Medical personnel, i.e., gynaecologists and midwives, should play an essential role in the decision-making process about vaccination by a pregnant woman.

Conflicts of Interest
None declared

REFERENCES

1. Korneta P, Rostek K. The Impact of the SARS-CoV-19 pandemic on the global gross domestic product. Int J Environ Res Public Health. 2021 May 14;18(10):5246. doi: 10.3390/ijerph18105246.
2. [Coronavirus infection report (SARS-CoV-2)] [Internet]. 2023 [cited 2023 Dec 19]. Available from: https://www.gov.pl/web/koronawirus/wykaz-zarazen-koronawirusem-sars-cov-2. Polish.
3. Hodcroft EB, Zuber M, Nadeau S, Vaughan TG, Crawford KHD, Althaus CL, et al. Spread of a SARS-CoV-2 variant through Europe in the summer of 2020. Nature. 2021 Jul;595(7869):707-12.
4. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. Lancet. 2020 Feb 15;395(10223):470-3.
5. Mehraeen E, Behnezhad F, Salehi MA, Noori T, Harandi H, SeyedAlinaghi S. Olfactory and gustatory dysfunctions due to the coronavirus disease (COVID-19): a review of current evidence. Eur Arch Otorhinolaryngol. 2021 Feb;278(2):307-12.
6. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Feb 15;395(10223):497-506.
7. Farkas KJ, Romaniuk JR. Social work, ethics and vulnerable groups in the time of coronavirus and Covid-19. Soc Regist. 2020;4(2):67-82.
8. Qiao J. What are the risks of COVID-19 infection in pregnant women? Lancet. 2020 Mar 7;395(10226):760-2.
9. Stanczyk P, Jachymski T, Sieroszewski P. COVID-19 during pregnancy, delivery and postpartum period based on EBM. Ginekol Pol. 2020;91(7):417-23.
10. Ziarnik M, Sosnowska J, Chmaj-Wierzchowska K, Figlerowicz M, Wysocki J, Mazela J. [Covid-19 - epidemiology, clinical course and managemet of pregnant women and newborn]. Standardy Medyczne/Pediatria. 2020;17:48-59. Polish.
11. [Polish Society of Gynaecologists and Obstetricians position on vaccination of pregnant women against COVID-19] [Internet]. 2021 [cited 2023 Nov 25]. Available from: https://www.ptgin.pl/sites/scm/files/2021. Polish.
12. Akhtar H, Patel C, Abuelgasim E, Harky A. COVID-19 (SARS-CoV-2) infection in pregnancy: a systematic review. Gynecol Obstet Invest. 2020;85(4):295-306.
13. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet. 2020 Mar 7;395(10226):809-15.
14. Di Mascio D, Khalil A, Saccone G, Rizzo G, Buca D, Liberati M, et al. Outcome of coronavirus spectrum infections (SARS, MERS, COVID-19) during pregnancy: a systematic review and meta-analysis. Am J Obstet Gynecol MFM. 2020 May;2(2):100107. doi: 10.1016/j.ajogmf.2020.100107.
15. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. J Autoimmun. 2020;109:102433. doi: 10.1016/j.jaut.2020.102433.
16. Jamieson DJ, Theiler RN, Rasmussen SA. Emerging infections and pregnancy. Emerg Infect Dis. 2006 Nov;12(11):1638-43.
17. Goncu Ayhan S, Oluklu D, Atalay A, Menekse Beser D, Tanacan A, Moraloglu Tekin O, et al. COVID-19 vaccine acceptance in pregnant women. Int J Gynaecol Obstet. 2021 Aug;154(2):291-6.
18. Prematunge C, Corace K, McCarthy A, Nair RC, Pugsley R, Garber G. Factors influencing pandemic influenza vaccination of healthcare workers - a systematic review. Vaccine. 2012 Jul 6;30(32):4733-43.
19. Mappa I, Luviso M, Distefano FA, Carbone L, Maruotti GM, Rizzo G. Women perception of SARS-CoV-2 vaccination during pregnancy and subsequent maternal anxiety: a prospective observational study. J Matern Fetal Neonatal Med. 2022 Dec;35(25):6302-5.
20. Ceulemans M, Foulon V, Panchaud A, Winterfeld U, Pomar L, Lambelet V, et al. Vaccine willingness and impact of the COVID-19 pandemic on women's perinatal experiences and practices - a multinational, cross-sectional study covering the first wave of the pandemic. Int J Environ Res Public Health. 2021 Mar 24;18(7):3367. doi: 10.3390/ijerph18073367.

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